

Article (cont. from p. 769)

TABLE 2: Cosmogonic Shadws

Saturnian ring from Holberg's data			
	a	r	
Mimas	3.075		
Co-orbitals	2.510	0.646	
Shepherds	2.345		
	2.310	0.63	
Cassini Center	1.885		
Outer B	1.845	0.655 (0.650-0.600)	
Holberg min	1.825		
Inner B	1.825	0.635	
Inner C	1.235		
Average 0.642 ± 2% (Theoretically, a 4% correction should be applied to the contraction ratio 2.9)			
Asteroidal region			
Jupiter	5.18		
Main belt		0.076	
outer limit	3.50		
High density		0.674	
outer limit	3.22		
High density		0.683	
inner limit	2.36		
Main belt			
inner limit	2.20		
Theoretical value		0.667	

[Alfvén, 1981b]

Cosmogonic Geology

A further analysis demonstrates that this means that we can reconstruct, with remarkably high accuracy, physical processes at the plasma-plasma transition, which must have taken place 4-5 billion years ago. In other words, the Saturnian ring should be considered as a fossil from cosmogonic times which is preserved because in the ring the diffusion is negligible.

Geologists can reconstruct early events by a study of ancient rock structure. Similarly, we can use Saturnian ring information to reconstruct parts of the evolutionary history of the Saturnian system. The asteroid belt is a similar fossil from which we can get essential information about the early state of the planetary system.

Conclusion

What has been said above has far-reaching consequences for our understanding of the evolutionary history of the solar system. We shall only mention a few of them: (1) the formation of the planetary system and the formation of the satellite systems were basically similar processes; (2) the evolution of an interstellar cloud to the present planets/satellites was governed by electromagnetic and mechanical effects up to the plasma-plasma transition and later exclusively by mechanical effects; (3) the formative plasma processes were similar to the aural processes in the sense that they consisted of a long series of apparently erratic local phenomena which, however, followed certain large-scale patterns, leading to an integrated result of a smooth buildup of the present structure of the solar system, and there is no evidence for large-scale turbulence or dramatic processes (as has been assumed in pre-space-age theories); (4) a further development of this approach can be expected to lead to a more detailed theory of the formation of planets and satellites and, hence, connect with geology, paleogeology, and related sciences; and (5) extrapolation backward in time will give us important information about the structure of the solar nebula and the formation of the sun and, hence, connect with galactic astronomy in general; further, the possibility of an accurate determination of 4-5 billion year old events will give us information of cosmological significance (e.g., to what extent, if any, the physical constants have varied).

References

- Alfvén, H., *Cosmic Plasma*, D. Reidel, Hingham, Mass., 1981.
- Alfvén, H., Paradigm transition in cosmic plasma physics, *Phys. Scripta*, 22(1), 10, 1982.
- Alfvén, H., Solar system history, *Astrophys. Space Sci.*, 79, 79-94, 1983a.
- Alfvén, H., Solar system history as recorded in the Saturnian ring structure, *Astrophys. Space Sci.*, 92, In press, 1983b.
- Alfvén, H., Cosmogony as an extrapolation of magnetospheric research, *Space Sci. Rev.*, in press, 1984.
- Alfvén, H., and G. Arrhenius, *Structure and Evolutionary History of the Solar System*, D. Reidel, Hingham, Mass., 1975.
- Alfvén, H., and G. Arrhenius, Evolution of the solar system, *NASA SP-345*, 1976.
- Baxter, D., and W. B. Thompson, Elastic and inelastic scattering in orbital clustering, *Astrophys. J.*, 183, 223, 1973.
- Baxter, D., and W. B. Thompson, Jetstream formation through inelastic collisions, in *Physical Studies of Meteor Planets*, NASA SP-267, 1971.
- Esposito, L. W., M. O'Callaghan, K. E. Sitomons, C. W. Hord, R. A. West, A. L. Lane,

Forum

Implementing the Peer Review Process in AGU Publications

Recently, Russell and Reiff [1984] presented a flow-diagram analysis of the AGU publication process indicating how publication delays naturally occur. Perhaps because of space limitations, their diagram did not include some important control statements. For example, according to their diagram, all manuscripts are either published or enter an endless loop. In fact, many papers end up elsewhere: As fish wrappers, in filing cabinets, or in non-AGU publications. Accepted papers can end up in the same places, but they have the advantage of having been published in an AGU journal. Significantly, the number of times the paper passes through the submission-refereeing loop (N) is not just journal dependent. N also depends inversely on μ , the density of Dogma in the paper. We are concerned with the publication process and are motivated by reports that N is unusually large in the case of certain distinguished colleagues, particularly when introducing new concepts or criticizing older approaches. Some suggestions are offered here to speed publication and consequently to assist in the smoother functioning of the scientific method in geophysics.

History provides numerous examples of the difficulty in publication of new ideas. For example in astronomy [Opik, 1977], magnetic reconnection [Dungey, 1983], and field-aligned currents [Dessler, 1984]. Oppenheimer [1985] was well aware of such problems and renounced us of the need for moderation in his monograph *The Open Mind*:

Science is novelty and change. When it comes, it dies. All history teaches us that these questions that we think the pressing ones will be transcended before they are answered, that they will be replaced by others, and that the very process of discovery will shatter the concepts that we today use to describe our predicament.

Such an open-minded attitude seems to have been implemented in a practical way and to a surprising degree by Dessler [1972] in his tenure as editor of the space physics section of the *Journal of Geophysical Research* (JGR). Dessler [1972] felt that authors had a right to publish their work so long as it met standards of relevance, clarity, and brevity. "The authors, on the other hand, do have a right to publish their work, and their reputations as scientists, and hence their careers, are strongly affected both by their ability to publish and by the quality of their published work. Therefore, I feel it is important to somehow maintain the journal's standards without harassing the authors." Dessler warned that "Unless the editor resolves to keep the journal an open forum, it will tend toward publication of ideas that are judged by the referees to be 'safe'."

Dessler resolved not to limit publication to ideas that "pleased the referees or that fell in with the majority opinion." Dessler frequently accepted well-written papers that infuriated some referees and welcomed the controversy and comments that naturally ensued. He often used only one referee to speed the review process. Most significantly, Dessler never asked the referee for his opinion as to whether or not the paper should be published. Dessler asked the referee four questions which I have paraphrased: Is the paper well written? Does it contain new material? Is

proper credit given to related work? Is the abstract appropriate?

By contrast, a referee for JGR-A is now asked first whether a paper is fully acceptable, basically acceptable but minor revision, basically acceptable but requires important revision, or is unacceptable. "Acceptability" is nowhere defined. It might be related to the Information for Reviewers, which appears on the reverse side of the Review Form. The Information for Reviewers contains guides for the completion of a written review and includes Dessler's four questions as well as seven others. The referee is asked to determine whether the research is "scientifically sound," and is told to note that the paper "need not agree... with your own view in order to be publishable." Assuming that the referee has read these instructions, one wonders how many referees can find "acceptable" views with which they cannot agree. Also, how often are scientific dogmas ever found unsound or irresponsible?

Under Dessler's editorship, in cases where a distinguished senior author submitted a paper it was usually reviewed by a graduate student because "the graduate student's advice could be easily ignored but the advice of a senior referee could not. Only one paper by a distinguished author was ever finally rejected for publication." This is clear that Dessler used the peer review procedure only as an advisory tool and not as the final determinant of what should be published. No referee can determine with certainty (on a scientific basis) what new idea will prevail in decades to come. Thus it is not in the best interest of science to give referees the power to make such a determination.

I have proposed to limit referee power by allowing an author to publish a disputed paper after he has heard the referee charges against it. At the same time, I have also proposed allowing the referee to publish his criticism of that paper. This proposal seems closely related to Dessler's procedure which led to rapid development of space physics and encouraged scientists to communicate in AGU publications.

References

- Dessler, A. J., Editing JGR: Space physics, *Eos Trans. AGU*, 53, 4, 1972.
- Dessler, A. J., The evolution of arguments regarding the existence of field-aligned currents, in *Magnetospheric Currents*, *Geophys. Monogr.*, vol. 28, edited by T. Potemra, AGU, Washington, D.C., 1984.
- Dungey, J. W., This week's citation classic: Interplanetary magnetic field and the auroral zones, *Current Contents*, 23, 20, 1983.
- Oppenheimer, J. R., *The Open Mind*, Simon and Schuster, N.Y., 1985.
- Opik, E. J., About dogma in science, and other recollections of an astronomer, *Ann. Rev. Astron. Astrophys.*, 15, 1, 1977.
- Russell, C. T., and P. H. Reiff, Publication process, *Eos Trans. AGU*, 65, 354, 1984.

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Referees and Controversy

P. J. Baum has broadened the discussion of the peer review process, particularly as it pertains to the space physics section.

of the *Journal of Geophysical Research* (JGR-A). The primary point raised by Baum is that the referees tend to be cautious with regard to the introduction of new ideas or ideas with which they do not agree. When asked to decide whether or not a paper should be published (rather than the decision being made alone and unambiguously by the journal Editor), referees tend to recommend against publication of papers they do not feel are both sound and safe.

This attitude on the part of the referees is, I feel, exacerbated by the present practice in JGR-A of identifying the referees at the end of the paper. "The Editor thanks referee A and referee B for their assistance in evaluating this paper." The advantage of this practice is clear: the referees are rewarded for their efforts by seeing their names in print and therefore are motivated to do a conscientious job when asked to review a paper. However, this practice has its negative aspects. By identifying the referees at the end of the paper, their status has been elevated nearly to that of a junior author or a junior editor. If a referee receives a paper whose author is marching to the sound of a different drummer, would he be willing to recommend it for publication, have his name placed at the end of the paper identifying him as a referee, and then listen to his colleagues say something like, "Why in the world did you ever let them publish that paper?" Instead, the referee of a controversial paper is most likely to recommend rejection. After several cycles of revision and rejection, the referee may finally give up and, in exasperation, ask that the Editor not reveal his name at the end of the paper. Thus, the present practice of JGR-A of identifying referees strengthens the natural inclination of referees to reject papers with which they personally disagree or that do not appear safe. I believe the practice of identifying referees should be discontinued.

I would also like to suggest a slight variant to Baum's suggestion that a controversial but clear paper be published and the referee be allowed to publish his criticism of it. Something like this was done in the late 1960's as can be seen by picking up almost any issue of JGR-A from that period. Once a paper was published, it was open to critical comment. Hardly an issue came out during my final years as Editor that did not have one or two critical comments on some earlier paper. Criticisms thus went beyond publishing the criticisms of the referees. Critical comments were immediately accepted for publication and transmitted to the author of the paper being criticized to see if he wished to write a response. If the author replied, his reply was transmitted in the critic to see if he wished to revise his comments. No refereeing was involved at any stage. After a few rounds in private, a concise statement of criticism and defense was at hand, the ensuing comment and reply were published, and the matter was regarded as closed. Ruminating controversy was not allowed. I felt that this part of the journal was one of the most entertaining, and it certainly enhanced the journal and contributed to the maintenance of high standards for publication.

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News

Passive French Drain

Major environmental concerns of the low-level radioactive waste management operations at Oak Ridge National Laboratory (ORNL) are that the groundwater in this location is near the soil surface and that there is a possibility of water infiltrating the disposal trenches at old solid waste storage areas (SWSA's). In the current SWSA (SWSA-0), a group of trenches (49-Trench) are located, and hold water with seasonal fluctuations ranging from 1 to 2 m. This seasonal wetting of the buried waste has resulted in the movement of ⁹⁰Sr to a surface stream within the disposal area. To reduce infiltration and prevent waste leaching, the entire 0.44-ha 49-Trench area was sealed with a bentonite clay cover in October 1978. Subsequent monitoring indicated that the cover had not corrected the trench water problem, which suggested a fairly safe, an alternate recharge source, or both.

To improve isolation of the 49-Trench area from shallow subsurface flow originating in upgradient recharge areas, and to suppress deep fluctuating groundwater, a French drain engineered barrier (see cover, this issue) was constructed in September 1983. The drain was installed in two sections having a design

width, total length, and depth of 1 m, 252 m, and 9 m, respectively, and an expected water table drawdown of 2 to 3 m at the deepest point. Discharge for each section of the drain enters small ephemeral streams which drain surface water from the site. The drain was excavated, lined with filter fabric, backfilled with crushed stone, and covered with a 0.6-m layer of excavated material in 17 days at a total cost of \$153,000 (\$600/m of drain). Post-construction water level monitoring in wells throughout the 49-Trench area indicates that the drain has suppressed the groundwater to a level below the bottoms of the waste trenches (4.9 m) over approximately 50% of the disposal site (within a 60-m distance of the drain). In addition, five trenches have been completely dewatered and no longer become saturated during periods of heavy rainfall.

From an economic standpoint the passive French drain was judged to offer considerable cost savings over other remedial actions considered for the site [for comparison, rock-filled caissons, \$682,000; slurry wall, \$168,000; buried waste, \$1,000,000]. The drain requires no operation or maintenance costs, has achieved a maximum groundwater drawdown of 4 m in the northeast corner of the site where the two sections of the drain intersect, and shows promise as a future site stabilization technique for problem trenches in ORNL's solid waste disposal areas.

ORNL is operated by Martin Marietta Energy Systems, Inc., under contract DE-AC05-84OR21400 with the U.S. Department of Energy.

This news item was contributed by E. C. Davis and R. G. Stanfield of the Environmental Sciences Division of Oak Ridge National Laboratory, Oak Ridge, Tenn.

Continental Drilling

The National Science Foundation (NSF) now is considering a proposal to begin initial studies on a 10-km drill hole, deeper than any drilled in the United States to date, to be located in the southern Appalachians. Earlier this year a National Research Council (NRC) committee recommended that this area—a thin-crust orophy—should be a first priority if and when monies are made available for deep drilling projects.

If NSF accepts the proposal, funding, reportedly \$2 million, will be made available to pinpoint the specific drill location and to develop the necessary base of regional information needed to conduct the drilling operations and scientific investigations. NSF is expected to reach a decision soon.

According to NSF, this proposal is but one of some \$20 million worth of proposals submitted for deep drill projects. NSF currently has been allocated approximately \$7 million in fiscal year 1985 for deep drill activities under the Continental Lithosphere program in NSF's earth sciences division. Leonard Johnson was recently appointed director of that program.

Although the concept for such a program was first developed in the early 1960's, this first deep drill project could be the beginning of what is envisioned as a long-term national program of continental research drilling to answer basic scientific questions. NSF would be the lead agency responsible for overall management, while two other departments, the Department of Energy (DOE) and the U.S. Geological Survey (USGS), would also share responsibility. The three agencies formalized their cooperation on April 2 when they signed an interagency accord [Eos, May 22, 1984, p. 361]. DOE has already conducted several drilling projects through its Office of Basic Energy Sciences. In September, DOE completed a well at Long Valley Caldera, California, drilling to a depth of 886 m (Eos, September 25, 1984, p. 721).

Support in Washington for a national drilling program appears to be running at an all-time high. The White House Office of Science and Technology Policy (OSTP) has recently given the concept its endorsement and was instrumental in planting the seed money at NSF to begin preparatory studies. More recently, the Senate showed its support in the form of Senate Resolution 439, passed in the early morning hours of October 3 in the Senate's scramble to adjourn. In the resolution (see box), the Republican and two Democratic senators—led by Senator Larry Presser (R-South Dakota)—expressed their approval of a national program of scientific continental drilling. In an unusual move, George Keyworth, science advisor to President Ronald Reagan and director of OSTP, responded to the resolution with a personal statement of support. On October 10 the House of Representatives passed a similar resolution as an amendment to the Interior Department appropriations bill; this bill was signed into law by the President on October 12.

The impetus to begin deep drilling activities in the Appalachians is based largely on a report of NRC's Continental Scientific Drilling Committee (CSDC), which gave highest

priority to drilling in the orophy area of the southern Appalachians, a geologic area which extends through the Carolinas, Georgia, and Alabama. Given funding, acquiring a 10-km drill with drilling operations beginning in FY 1986. A preliminary study suggested that it would take up to 3 years at a cost of \$40 million for drilling alone. Scientific activities could add an additional \$20 million.

According to the CSDC report "Priorities for a National Program of Continental Drilling for Scientific Purposes," the major objective of the Appalachian drill will be to evaluate and verify the current model of overthrusting tectonics. A better understanding of the thrusting mechanism could be obtained by actually drilling through the thrust sheets. If the sedimentary or metasedimentary Paleozoic rocks found below the thrust sheets are of the same type found to the west beyond the sheets, then the thrusting hypothesis will have been verified.

Samples will be taken of the overthrust sheet itself, the younger sediments lying below, and the deep basement below that. Previous studies suggested that a 10-km hole should be drilled in two phases. The first would be a narrow-diameter hole to approximately 2,400 m. The second stage would be a larger-diameter hole (approximately 46-61 cm) to the proposed total depth of 10 km.

Basic scientific research that has been prioritized

In Congress: Drilling Resolution

The following is the text of the resolution on continental scientific drilling passed by the Senate and the House of Representatives and signed into law by President Reagan on October 12.

"That to express the sense of the Congress that the Continental Scientific Drilling Program is an important national scientific endeavor, benefiting the commerce of the Nation, which should be vigorously pursued by government and the private sector.

"That the Continental Scientific Drilling Program is an important national scientific endeavor that is vital to the understanding of the geologic evolution of the Earth and the economic value of its resources;

"That the most effective and efficient means of utilizing the fullest potential of the Continental Scientific Drilling Program is through a cooperative effort by the Department of Energy, the National Science Foundation, and the United States Geological Survey;

"Many important commercial and scientific advances may result from the Continental Scientific Drilling Program; and

"Many foreign nations are engaged in a comparable deep drilling program, and cooperation and coordination would be beneficial to United States efforts.

"It is the sense of the Congress that—

(1) The Continental Scientific Drilling Program is an important national scientific endeavor by the United States which should be enthusiastically implemented through a joint cooperative effort among the United States Department of Energy, the National Science Foundation, and the United States Geological Survey;

(2) The private sector should be encouraged to support the Continental Scientific Drilling Program and the participating agencies should solicit appropriate private sector participation in such Program; and

(3) The United States Government should cooperate to the extent practicable with the international community in developing this important scientific and technical activity."

posed includes studying active silicic caldera systems, fossil silicic caldera systems, and in situ stress regime studies, as well as research into the petrology of the rocks associated with faulting. CSDC emphasized, however, that the program has no resource objective, although private industry would certainly be interested in the results. In addition, the results, which might apply to other thin-crust orophy areas of the world, already have been requested by scientists of other nations. Subsequent downhole studies also have been proposed.

Another proposal currently under review at NSF concerns the long-term management of a national program of continental drilling, which could include the proposed Appalachian well but was not developed specifically with it in mind. The DOSECC (Deep Observational Sampling of Earth's Continental Crust) Group has submitted a 5-year proposal asking for roughly \$30 million per year. According to Barry Raleigh, director of the Lamont-Doherty Geological Observatory and proponent for DOSECC, the group's primary objective is to manage the program for NSF with an emphasis on the scientific potential of such a long-term effort.

Speaking at a briefing of the NRC's Board

on Earth Sciences in Washington, D. C., on October 11, Raleigh emphasized that the DOSECC proposal is related to the recommended Appalachian drill only insofar as this site would represent one well in a long-term national effort that the DOSECC group hopes to manage. As is inevitable, there has been some discussion within the geological community about whether large amounts of funding should be spent on one deep hole or spread out among many smaller wells. Thus far, DOE's approach to continental drilling has been the latter.—DJT

Alaskan Oceanography

Physical oceanographers, chemists, and biologists will soon begin studying the seas around northern Alaska as part of an international effort to learn how increased fishing, oil and gas drilling, and land-based farming will affect marine life. The \$2.5 million National Science Foundation (NSF)-funded study, called ISHTAR (Inner Shelf Transfer and Recycling in the Bering and Chukchi Seas), will involve scientists from the United States, Belgium, and Denmark.

According to NSF, previous studies suggest that, despite a short growing season, the seas around the Bering Strait produce more plant life than most marine areas of the world. However, the source of mineral nutrients for this plant life and its destination in the food web or organic sediment is not well understood. The researchers will trace nutrients from the Yukon River and the deeper waters of the Bering Sea to the continental shelves of the Bering and Chukchi seas in an attempt to better understand what happens to land and marine organic matter when it enters this continental shelf ecosystem.

Preparation for the study will begin soon, with field work scheduled to begin in the spring of 1985. Taking part in the study will be scientists from the universities of Alaska, Washington, South Florida, and Texas and the Brookhaven National Laboratory. In addition, researchers from the University of Liege in Belgium and the University of Aarhus in Denmark will participate. The program, funded by NSF's division of polar programs, is headed by C. Peter McRoy of the University of Alaska.

Geophysical Events

This is a summary of *SEAN Bulletin*, 9(9), September 30, 1984, a publication of the Smithsonian Institution's Scientific Event Alert Network. The complete bulletin is available in the microfiche edition of *Eos* as a microfiche supplement or as a paper reprint. For the microfiche, order document E84-010 at \$2.50 (U.S.) from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20009. For the paper reprint, order *SEAN Bulletin* (giving volume and issue numbers and issue date) through AGU Separates at the above address; the price is \$3.50 for one copy of each issue number for those who do not have a deposit account, \$2 for those who do; additional copies of each issue number are \$1. Subscriptions to *SEAN Bulletin* are available from AGU Fulfillment at the above address; the price is \$18 for 12 monthly issues mailed to a U.S. address, \$28 if mailed elsewhere, and must be prepaid.

Volcanic Events

Erebus (Antarctica): vigorous explosions, clouds, and incandescent tephra.

Mayon (Philippines): Explosive activity reintensifies; 73,000 evacuated.

Apl Sian (Indonesia): Seismicity and minor tephra emission since January; ash column and noise ardent in September.

Home Reef (Tonga): Pumice from March eruption found 1300 km to the WSW.

Unzen (New Britain): Mild Strombolian eruption.

Rabaul (New Britain): Seismicity, ground deformation rates decline.

Ninam (Bismarck Sea): Ash-laden emissions, incandescence.

Unzen (Japan): Earthquake swarm.

Campi Flegrei (Italy): More M > 3 events with wider distribution, but seismic energy release unchanged and uplift slows.

Etna (Italy): Lava flows, Strombolian activity, and ash emission.

Kilauea (Hawaii): Phase 2b; highest fountains of 1983-1984 eruption; tephra.

Mount St. Helens (Washington): New lobe in collapse zone on composite dome.

Villarrica (Chile): Brief ash eruption; increased seismicity.

Atmospheric Effects: 2 years of lidar data from Germany summarized.

Mt. Erebus Volcano, Ross Island, Antarctica (77°35'S, 167°17'E). The following is a report from Philip Kyle and Jürgen Kienle. All times are UT.

"Brief reports from technical staff operating seismic instruments at Scott Base and Infrasonic equipment at McMurdo Sound indicate

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cate a significant change in eruptive activity at Mt. Erebus.

"Mt. Erebus, the southernmost active volcano in the world, has contained a convection lava lake since 1972. The semicircular lake increased in size, reaching about 60 m in length by 1976. Since then, little change in size has occurred. Activity associated with the lava lake has consisted of quiet degassing with emission of about 230 metric tons of SO₂ and 24 metric tons of aerosol particles per day. Two to six small strombolian eruptions occurred per day, often ejecting clumps of anorthoclase phonolite onto the crater rim, about 820 m above the lava lake.

"The reports indicate that starting on September 13, a number of large explosions were recorded by the International Mt. Erebus Seismic Study (IMESS) network situated on the volcano. By infrasonic detectors in Windless Bight (about 20 km away), by the WSSN seismograph at Scott Base (37 km distant), and by a tidal gravimeter at South Pole station (about 1400 km from Mt. Erebus). Previous strombolian activity has generally been too weak to record except on the IMESS seismic stations.

"From September 13 to 17 the volcano was very active, with 8-19 large explosions (recorded on WSSN, IMESS, and infrasonic instruments) per day, decreasing to 2-8 per day during September 20-25, then increasing again to 12-27 explosions per day during September 26-29. Numerous mushroom-shaped clouds were reported and were estimated to rise as much as 2 km above the summit of the 3724-m-high volcano. Observers at McMurdo, 37 km SW of the volcano, reported hearing explosions on September 16 at 0459, and September 20 at 1133 and 1135. Slight earth tremors were also felt there. On September 17 at 1010, a bright summit glow was observed from McMurdo Sound. Six minutes later, incandescent bombs were ejected to about 600 m above the summit; observers at Butter Point, 70 km from the volcano, reported seeing incandescent tephra from this explosion, which produced one of the larger infrasonic and seismic signals of the eruption sequence.

"Ash covered the NW side of the volcano down to 3400 m elevation. Fumaroles around the summit crater showed a substantial increase in activity. A 300-500-m-high very narrow plume was observed lower on the E flank (1800 m). Observers suggested that it might have been a geyser."

Information Contacts: Phillip R. Kyle, Coordinator, IMESS, Dept. of Geoscience, New Mexico Institute of Mining and Technology, Socorro, NM 87801; Jürgen Kienle and Charles Wilson, Geophysical Institute, University of Alaska, Fairbanks, AK 99701.

Mayon Volcano, Luzon Island, Philippines (13.26°N, 123.68°E). All times are local (= UT + 8 hours). The following, primarily from Olimpo Peña, supplements the preliminary report in last month's bulletin.

"Eruptive activity started September 9 at

1923. Initial activity was dominantly strombolian, with incandescent spattering at the summit and production of small lava flows. A mound of solidified lava inside the crater blocked the 1968 notch at the SW rim of the crater, so the small lava flows and initial pyroclastic flows (see below) moved predominantly NW.

"A fairly strong eruption September 10 at 2300 marked the start of vulcanian activity. Ash-laden steam clouds rose 5 km above the 2462-m summit, and a pyroclastic flow moved down to the NW, reaching 700 m elevation. Stronger explosions on September 11 opened the notch at the SW rim, so more of the later lava and pyroclastic flows moved SW than NW. The eruption continued to intensify, peaking September 13. Cauliflower-shaped ash-laden steam clouds accompanied by rumbling sounds reached a maximum height of 15 km before drifting SW, W, and NW. Continuous volcanic tremors were recorded, punctuated by explosion earthquakes. Two lava flows emerged through the SW breach. One reached 500 m elevation adjacent to and W of the 1978 flow. The other, a little farther W, advanced to 1400 m elevation. The new lava is porphyritic augite-hypersthene andesite.

"Activity gradually declined September 14-21. A mild eruption on September 22 at 0502 was accompanied by a volcanic earthquake felt at intensity 11 on the Modified Rossi-Forel Scale at the Mayon Resthouse Observatory, at 700 m altitude on the NW flank. A relatively quiet period followed. A very strong eruption September 23 at 0133 ejected voluminous ash-laden steam clouds that reached 10 km in height. Incandescent tephra rose 2 km above the summit and spread in all directions, covering the summit area with red-hot tephra to about 1500 m elevation. A large notch was formed in the SE rift of the crater and a smaller one in the E rim. Subsequent pyroclastic flows were directed predominantly SE and E, although some moved in other directions along gulleys. Ash spread within about 50 km to the SW, W, and NW of the summit. Areas E and NE of the volcano received most of the fine ashfall tephra generated by pyroclastic flows. The eruption continued to intensify until September 24. Voluminous ash emission, sometimes sustained for 5 minutes, occurred at intervals of 2-15 minutes and was accompanied by strong detonations and at times by electrical discharges. Maximum height of the eruption clouds was 15 km. On September 24, at 1614, a nuee ardente reached the nearest village. A large volume of pyroclastic flow material was deposited on the SE flank. The eruption started to decline September 25. By October 5, activity was limited to weak steaming and faint to moderate crater glow, accompanied by volcanic tremors and discrete earthquakes. Press sources reported reinitiation of the eruption October 6. Ash-laden steam clouds

rose as much as 1.7 km above the summit and lava flowed 1 km from the crater. "Mudflows generated by rain destroyed three sections of the Legapi-Santo Domingo highway roughly 8 km SE of the volcano. Larger mudflows on September 27 overran the same portion of highway. Two bridges were destroyed along the Malibon-Santo Domingo highway, roughly 8 km E of Mayon. As of September 30, press sources reported that 6,500 hectares of farmland had been covered by mudflows.

"Implementation of the Mayon preparedness plan was fairly smooth. On September 10, the area within 8 km of the summit was demarcated and all residents were recommended for evacuation. On September 12, the danger zone was extended to 8 km from the summit on the S and SW flanks. About 26,000 people were evacuated during the first phase of the eruption. On September 23, the danger zone was expanded again to 10 km from the summit on the SE side and 8 km from the summit around the rest of the volcano. All residents of that area were recommended for evacuation, and the number of evacuees swelled to more than 73,000 at 50 centers. No casualties were attributed directly to the eruption or mudflows."

Information Contacts: Olimpo Peña, Philippine Institute of Volcanology, 5th Floor, Hizon Bldg., Quezon Blvd. Extension, Quezon City, Philippines; Deutsche Presse-Agentur; Associated Press.

Apti Slau Volcano, Sangehi Islands, Indonesia (2.78°N, 123.48°E). All times are local (= UT + 8 hours). Adjat Sudradjat provided the following information, supplementing the report from press sources in last month's bulletin.

An explosive eruption on September 5 was preceded by seismicity and minor tephra ejection. Rumblings were heard on January 4, followed by an explosion that ejected ash. From February through April, rumbling preceded episodes of ash emission. On May 31 at 0724, an ash column rose to 1.5 km above the summit. During the night of June 7-8, glowing lava fragments were ejected from the main

erater. On July 20, ash emission was accompanied by rumbling. The number of local seismic events increased through the first half of 1984 (see Table 1). Volcanic tremors were recorded August 24, although no surface activity was seen. Ash emission occurred September 3 at 0417, producing an eruption column that rose 600 m. Glowing lava fragments were occasionally ejected. Rumbling accompanied the activity.

On September 5 at 0905, an ash column rose 4 km from the main crater. Nuees ardentes flowed 2 km to the south and 1 km to the west, with estimated volumes of 1.5 and 0.5 x 10⁶ m³. One week later, ash emission was continuing and weak rumbling was heard. Ten volcanic and five tectonic earthquakes were recorded daily through September 16. About 4500 people were temporarily evacuated from the south and west sides of the danger zone but were allowed to work in their fields during the day. No casualties were reported.

Information Contacts: Adjat Sudradjat, Director, Volcanological Survey of Indonesia, Diponegoro 57, Bandung, Indonesia.

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TABLE 1. Number of Local Earthquakes per Month Recorded at Apti Slau

Month, 1984	Tectonic Earthquakes	Volcanic Earthquakes
January	62	18
May	82	57
June	204	139
July	156	85

Data courtesy of Adjat Sudradjat.

erater. On July 20, ash emission was accompanied by rumbling. The number of local seismic events increased through the first half of 1984 (see Table 1). Volcanic tremors were recorded August 24, although no surface activity was seen. Ash emission occurred September 3 at 0417, producing an eruption column that rose 600 m. Glowing lava fragments were occasionally ejected. Rumbling accompanied the activity.

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Meteoritic Events

Fireballs: SE, SW Australia; New Zealand; N Pacific Ocean (2500 km SW of Hawaii); S Florida, NW Georgia, central Kansas-Neb., W Nebraska, central Oklahoma, W Oregon-E Washington, E Texas, E Washington (2).

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ference on Advances in Infiltration. The stated purpose of the conference was to report and evaluate recent developments in the movement of water into soil. Ninety papers were presented at the conference, but only 38 manuscripts are included in this volume, which represents the proceedings for the conference. Six manuscripts each are presented under the designated topics of physics of infiltration, parameters in infiltration equations, special problems and phenomena, measurement of infiltration, applications in agriculture, and applications in water-related hydrology. Brief abstracts are included for 23 papers presented in poster sessions at the conference.

A 10-page summary of the proceedings is conveniently provided for those readers who wish to obtain a quick overview and perspective for published contributions. The purpose of the summary is "... to select the key points or findings from the conference papers and to integrate this information under topical headings." These headings "resemble but do not match" proceeding topics. Infiltration models were divided into basic equations of porous media flow (nine papers), physically based models (five papers), and empirical equations (four papers). The author of the summary concludes that a major strength of the proceedings is the extension of infiltration theory by a number of authors beyond overly simplistic assumptions commonly associated with one-dimensional flow into homogeneous soil. More realistic cases are presented which account for multidimensional soil-water flow, preferential flow through macropores, air effects (multiphase flow), effects of surface sealing, soil-water hysteresis and redistribution during the postinfiltration period, effects of slowly permeable subsurface soil layers, and the effects in frozen soils. Development of simplified models for conditions more complex than one-dimensional infiltration into homogeneous soil is a suggested need for future research. Another strength is the emphasis upon evaluation, spatial variability, and temporal variability of infiltration parameters. Particular attention was given to hydraulic properties of soil as well as to integral and empirical parameters. Improvement in parameter evaluation is also suggested as a major need for further research. A third strength is improvement in the measurement of infiltration in the field by use of the direct techniques of ring, furrow, and sprinkler infiltrometers and indirect techniques involving time domain reflectometry and passive microwaves. Additional improvement in accuracy and efficiency of infiltration measurement is cited as a research need.

The reviewer found two of the papers on multidimensional soil water flow especially interesting. Infiltration from irrigation furrows, trickle irrigation systems, subsurface disposal of effluent from septic tanks, and surface application of treated domestic wastewater by overhead sprinklers are but a few examples of situations in which only a fraction of a given soil receives water application, causing flow to occur in two and three dimensions. Using quasi-linearized forms for the multidimensional form of the Richards equation, two different authors presented analytical models for multidimensional infiltration. One author

presented analytical models for two- and three-dimensional steady infiltration where water is applied to geometric patterns of "fractional wetting" of the soil surface. At "shallow" soil depths the need for these models, which describe the multidimensional aspects of water flow, was clearly shown. However, below some characteristic depth, water from all surface areas of water application coalesces. At that point, simpler models for one-dimensional infiltration were shown to be adequate. The second author described a general analytical model for transient two-dimensional infiltration in which water is applied at specified intensity to the soil surface in strips separated by zones of evaporation. The model can be used for nonuniform and nonperiodic strip sources. The model is time dependent and capable of providing valuable insight into the transient nature of two-dimensional flow from periodic strip sources with the simpler cases of uniform infiltration and evaporation. Both of these papers provide important new concepts and mathematical tools for improving the understanding of infiltration physics for multidimensional flow. This book is recommended as an excellent resource book for recent developments concerning water entry into soil.

Robert Mansell is with the Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

The Morphostructure of the Atlantic Ocean Floor: Its Development in the Meso-Cenozoic

V. N. Litvin (transl. from the Russian by V. M. Divid, N. N. Proskovsk, and Yu. U. Rodzhabov), D. Reidel, Dordrecht, Mass., x + 172 pp., 1984.

Reviewed by Dennis E. Hayes

The *Morphostructure of the Atlantic Ocean Floor* is a useful review of the principal morphologic, tectonic, sedimentary, and geophysical features of the Atlantic Ocean. The treatment of these topics is primarily a descriptive one based mostly upon data collected by Soviet scientists. The book is a recent translation of a 1980 edition published in Russian and as such suffers in two important ways: (1) The material and views presented take virtually no cognizance of research done since the mid-1970s and (2) the actual translation is often awkward (for example, platform tectonics instead of plate tectonics; ocean bottom spreading instead of seafloor spreading; bathymetry instead of bathymorphological or, better still, morphology).

V. N. Litvin is a scientist of international stature and his book provides a worthwhile if slightly dated descriptive summary of the morphology and evolution of the Atlantic Ocean floor. Although there are no new scientific insights presented in the book, the large collection of mostly Soviet references will be of interest to Atlantic Ocean researchers.

Dennis E. Hayes is with the Lamont-Doherty Geological Observatory, Palisades, N.Y. 10964.

Geophysical Monograph 28

MAGNETOSPHERIC CURRENTS (1984)

T. A. Potemra, Editor

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Physical Oceanographers. The Physical Oceanography Branch of the U.S. Naval Oceanographic Office seeks full-time Oceanographers for the study of the effects of ocean currents and thermohaline structure on undersea systems using data collected from various platforms for a variety of projects. The projects involve the collection, analysis and reporting of physical oceanographic data directly applicable to relevant Navy environmental requirements. Up to 50% field duty may be required. Multiple vacancies at the GS-7, 9 and 11 levels are available depending upon qualifications and experience and remain open until filled. Salary range: \$17,221 to \$33,195.

Please contact (for required form): Debra Stiles, #N00-72(84), Commercial 001-688-2720, Autovon 485-5781, or FTS 494-5780, U.S. Naval Oceanographic Office, Management & Personnel Division, Personnel Operations Branch, Code 4320, Bay St. Louis, MS 39521, Mississippi 39522.

University of Utah: Structural Geology/Tectonics/Geophysics. The Department of Geology and Geophysics at the University of Utah seeks applications for a tenure track position in structural geology, tectonics or geophysics. It is anticipated that this position will be filled at the assistant professor level, but applicants by more senior persons will be considered. The position requires a Ph.D. with emphasis in structural geology, regional tectonics or geophysics. The new faculty member will have the opportunity to teach in the area of his or her research and may also be effective in supervising level courses. The successful candidate will be expected to establish a vigorous research program involving graduate students. The person who fills this position will join an active program in structural geology and tectonics that includes both field projects and integrated geology/geophysics as well as mechanical fluid chemistry studies of structures in the western Cordillera. There is an excellent opportunity to collaborate with other faculty in structural geology, sedimentology, geophysics, geochemistry and petrology. A vita, copies of publications, names of three persons that may provide references, and a letter outlining the candidate's research and teaching interests should be sent to Dr. William H. Ridd, Chairman, Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112-1183. Deadline for receipt of applications is December 31, 1984 with the appointment starting in September 1985.

The University of Utah is an equal opportunity/affirmative action employer.

Montana Bureau of Mines & Geology/Montana Tech. Applicants are invited for a non-tenure track academic research appointment in hydrogeology to be filled at the research instructor or research assistant professor level.

This position will have broad research responsibilities in one or more of the following areas: regional and site-specific hydrogeological studies, hydrogeological and hydrochemical aspects of surface coal mining and reclamation, and assessment of aquifer characteristics for geologic basins and hydrochemical evaluations. The position entails considerable field work and will be located in Billings, Montana.

Candidates must have a Master's degree (Ph.D. preferred) in Hydrogeology or a related science and at least three years of hydrogeological experience, with emphasis on analysis and quantitative aspects of hydrogeology.

The closing date for applications is November 12, 1984. Salary will be \$26,000—\$33,000/year depending upon education and experience. Applications will resume and names and phone numbers of three references should be sent to: Director, Montana Bureau of Mines and Geology, Montana College of Mineral Science and Technology, Butte, MT 59701.

An EEO/AA Employer.

University of Wyoming/Department of Geology and Geophysics. The Department of Geology and Geophysics encourages applications from students interested in pursuing graduate research in the fields of igneous and metamorphic petrology and geochemistry. Current research topics include: igneous field and laboratory studies, igneous and metamorphic petrology, petrogenesis of igneous rocks, and the evolution of orogenic terranes. Facilities include: analytical geochronology lab for whole-rock and trace element analysis, a fully automated CAMECA microprobe, two (JEOL) scanning electron microscopes, a thermal ionization mass spectrometer for analyzing Rb-Sr, Sm-Nd, and U-Th-Pb isotopes, a microstructural petrology lab, and an experimental petrology lab. Applicants should send:

(1) a curriculum vita; (2) a brief statement outlining research interests; (3) a brief statement outlining teaching interests; (4) three letters of recommendation; (5) a copy of graduate transcripts.

John C. Budde, Department of Geology and Geophysics, University of Wyoming, Laramie, WY 82071.

Marine Superintendent
Lamont-Doherty Geological Observatory of Columbia University

The Lamont-Doherty Geological Observatory, a major earth science and oceanographic institution, seeks an experienced marine superintendent to oversee the operation of the R/V CONRAD. This marine superintendent manages selected aspects of a shore-based office in the responsibility for logistical, budget, personnel, and other aspects of the CONRAD's year-round operation.

Applicants must have experience in managing ship operations, preferably oceanographic vessels. Sea going experience and possession of an officer's license is highly desirable.

Please send resume and salary requirements to Mary Burton, Lamont-Doherty Geological Observatory, Palisades, New York 10964.

Columbia University is an affirmative action equal opportunity employer.

OCEANOGRAPHER

GS-1360-12,
SALARY \$30,549—\$39,711

The Remote Sensing Branch of the Naval Ocean Research and Development Activity (NORDA) located at National Space Technology Laboratories, Bay St. Louis, MS, is seeking qualified applicants for a physical oceanographer with experience and interest in research studies of ocean dynamics via satellite altimetry. Duties will include providing oceanographic interpretation of the GEOSTAT mesoscale product; aid in obtaining subject procedures for the production of mesoscale analysis; assist in the GEOSTAT Ocean Application Program (GOAP) through the coordination of ongoing objective and subjective data system development and interfacing with programmers to provide oceanographic guidance for software implementation; develop methods for the production of Expanded Ocean Thermal Structure (EOTS) bogus files from altimeter derived topography; responsible for reporting results through published technical reports, journal papers and technical briefings. Applicants must have, as a minimum, a bachelor's degree in oceanography or related disciplines, and a minimum of three years of professional experience or graduate education, or a combination of both. Qualified applicants should contact the Naval Ocean Research and Development Activity, NSTL, MS, 39529. ATTN: Code 140 or call (601) 688-4640 for application forms.

An EEO Employer

US Citizenship required

High Altitude Observatory/Scientific Visitor Program. Scientific visitor appointments at the High Altitude Observatory are available for new and established Ph.D.'s for up to one year to carry out research in solar physics, solar-terrestrial physics, and related subjects. Applicants should provide a curriculum vita, including education, work experience, publications, the names of three scientists familiar with their work, and a statement of their research plans. Applications must be received by 15 January 1985 and they should be sent to: The HAO Visitor Committee, High Altitude Observatory, National Center Atmospheric Research, P.O. Box 3000, Boulder, Colorado 80507-3000.

NCAR is an Equal Opportunity/Affirmative Action Employer.

Yale University/Solid Earth Geophysics. The Department of Geology and Geophysics is soliciting applications for a junior faculty position in solid earth geophysics to begin in the autumn year 1985. Areas of interest to the department include seismology, experimental geophysics, mechanical and physical properties of rocks and minerals, geodynamics, tectonophysics, and geodesy. Curriculum vitae, publications and the names of three scientists to whom references should be sent by December 1, 1984 to: Karl R. Van der Voort, Chairman, Department of Geology and Geophysics, Yale University, Box 3666, New Haven, CT 06511.

Yale University is an equal opportunity/affirmative action employer and encourages applications from all qualified scientists.

Postdoctoral Position/Naval Postgraduate School. The Ocean Technology Laboratory has available a postdoctoral position for a person interested in the analysis and interpretation of satellite altimetry data. The tenure is for one or two years. The successful candidate should have a Ph.D. in physical oceanography and altimetry experience with numerical analysis and interpretation of altimetry data. The position is also available. Resumes can be sent to: Dr. R.L. Lister, Code 68 J, Naval Postgraduate School, Monterey, CA 93941.

Ph.D. Scientist/High Altitude Observatory, National Center for Atmospheric Research. Candidates for independent and collaborative research aimed at understanding a broad variety of solar and related atmospheric phenomena. The position involves the development of analytical and numerical techniques for the interpretation of altimetry data and the use of altimetry data to study the dynamics of the solar interior, solar atmospheric systems, interplanetary medium, and related astrophysical systems. Successful candidates will have experience in theoretical studies of magnetized plasmas.

Position available: 9/1/85. Salary: \$27,104—\$40,056/year. Scientists' appointments are for terms up to three years; individuals may be appointed to the next higher level in accordance with the university's policy. Applications should be sent to: R. M. MacQueen, HAO, NCAR, PO Box 3000, Boulder, CO 80507-3000.

NCAR is an equal opportunity/affirmative action employer.

Dean of Oceanography

Oregon State University

Oregon State University invites nominations/applications for Dean, College of Oceanography. The dean provides leadership to a graduate college of oceanography with 93 faculty, 80 students, and excellent research facilities in Corvallis and Newport. Salary dependent upon qualifications. Tenured, full-time appointment. Completed applications for the position should be received by December 31, 1984. Oregon State University is an AEOE employer and encourages applications from females and minorities. Address: Dr. John S. Allen, Chairperson, Dean Search Committee, College of Oceanography, Oregon State University, Corvallis, OR 97331.

Manager, Research Computer Facility. The University of Oklahoma is looking for a person to manage a recently purchased VAX 11/780 computer facility dedicated to research in the Geosciences. Hardware and software are designed for image processing, seismic reflection data processing, and graphical display of geological, geographical and geophysical data. In addition to the VAX 11/780 with 8mb of CPU memory, the system includes an array processor, five tape drives, five disk drives, a line printer, a 36" electronic plotter, and two high resolution graphics workstations with a digitizing board. The image processing hardware includes a Gould-Eldec 11800 processor with 15 image memory planes, real time disk memory and three high resolution color monitors.

The person selected must have at least a BS degree in science, math, engineering or related field and two years programming experience including FORTRAN, educational or computing experience in solid earth geophysics or meteorology. Experience with the VAX VMS operating system as well as supervisory experience are desired.

Salary is negotiable. People interested in the position should send a resume, copies of academic transcripts, and the names, addresses and telephone numbers of three references to: John Wickham, Director, School of Geology & Geophysics, University of Oklahoma, Norman, OK 73019.

Applications must be received by November 2, 1984.

Saint Louis University. The Department of Earth and Atmospheric Sciences invites applications for a tenure-track assistant professor position in geophysics effective for the fall of 1985. We seek an individual with broad interests in seismology and related research programs in seismology and earth structure. Preference will be given to candidates who can teach existing courses in plate tectonics, geodynamics and/or geophysics. The successful candidate must have a Ph.D. degree and will be expected to maintain an active research program, to teach graduate and undergraduate students, and to supervise graduate student research. The application deadline is January 15, 1985. Applicants should send a curriculum vita, a statement of research and teaching interests and the names of three references to: Dr. Brian J. Mitchell, Chairman, Department of Earth and Atmospheric Sciences, Saint Louis University, P.O. Box 8099, St. Louis, MO 63186.

Saint Louis University is an affirmative action/equal opportunity employer.

Civil Engineering. The University of Notre Dame is seeking applications for a tenure track Assistant or Associate Professor position in the Department of Civil Engineering. Applicants should have an earned Ph.D. in Civil Engineering or a related field, and be interested in research in the field of structural engineering, design, and/or construction. The successful candidate will be expected to teach graduate and undergraduate students, and to supervise graduate student research. The application deadline is January 15, 1985. Applicants should send a curriculum vita, a statement of research and teaching interests and the names of three references to: William G. Dray, Chairman, Department of Civil Engineering, University of Notre Dame, Notre Dame, IN 46556.

Affirmative Action/Equal Opportunity Employer.

SUPERVISORY OCEANOGRAPHER

DIVISION LEADER

NOAA's Pacific Marine Environmental Laboratory is seeking qualified candidates for the position of Division Leader, Marine Resources Research Division. The Division is located at the Hatfield Marine Science Center, Newport, Oregon and is engaged in multidisciplinary research into deep seafloor exchange processes. Current activities include research into the effects of hydrothermal venting, oceanic crustal tectonic processes, seafloor heat flux, and particle transport in the benthic boundary layer. The Division Leader has responsibility for program planning and budgeting, technical supervision of MRDD staff and liaison with other NOAA components. The Division Leader has primary obligation for leading the MRDD research program, but there is adequate opportunity to conduct individual research.

Candidates should have at least a PhD in physical oceanography and/or geology or related physical sciences. Candidates must have at least three years of professional research experience of which at least one year must have been comparable to the GS-14 level in the Federal service. Candidates must have experience in sea floor processes research including biological, chemical, geological or physical oceanography or they will not be found qualified for this position. Also, candidates must demonstrate that they have the ability to conduct sea floor processes research; ability to conduct independent research; ability to develop, implement and monitor scientific research programs; ability to supervise a scientific/technical staff; ability to ensure fiscal accountability through management of program funds within budget constraints; ability to make technical presentations, both orally and in writing; and; ability to implement an effective Affirmative Action (EEO) program. Applicants are asked to describe their experience in each of the above seven factors. These responses should be considered as attachments to the basic application form. The salary ranges from \$50,495 to \$65,642 per year. This position is in the Federal Competitive Service; however, persons with no previous Federal service may apply. Applicants should refer to announcement number PMELAWSC 84-292 (PM) when submitting applications (SF-171, "Personal Qualifications Statement") available at most Federal agencies to:

NOAA, WASC, Personnel Division
7600 Sand Point Way NE
Seattle, WA 98115

by November 30, 1984. For further application information call Pete Macies at 206-526-6848. For further details on duties contact Dr. E. N. Bernard, Director, PMEL at 206-526-6800.

Francis G. Stebbins, Dean, College of Geosciences, University of Oklahoma, 601 Elm Street, Room 488C, Norman, OK 73019. Consideration of applications will begin January 1, 1985. The University of Oklahoma is an Equal Opportunity/Affirmative Action Employer.

Visiting Appointments/Princeton University. A limited number of one-year visiting appointments, with the possibility of renewal, are available on a competitive basis for near and mid-career Ph.D.s to carry out research in dynamics and predictability of the atmosphere and oceans, climatology, atmospheric and oceanic chemistry, basic geophysical fluid dynamics, and solid earth geophysics. Successful applicants will have access to the facilities of the Geophysical Fluid Dynamics Laboratory/NOAA. Information and application forms can be obtained from: Chairman, Visiting Scientist Selection Committee, Geophysical Fluid Dynamics Program, Princeton University, P.O. Box 308, Princeton, New Jersey 08542.

Princeton University is an equal opportunity employer—MFP.

Anticipated Petrology/Metamorphology/Volcanology/Louisiana State University. The Department of Geology is searching for candidates to fill positions in metamorphic petrology, economic mineralogy, and volcanology associated with studies of pyroclastics, remote sensing of volcanic landforms, or geophysical interpretation of subsurface volcanic features. Successful applicants are expected to offer graduate and undergraduate courses in their specialties and to develop a strong record of funded research and publications. The positions are at the Assistant Professor level, but applicants with a high rank will be considered for candidates with exceptional ability and appropriate experience.

Major departmental equipment available includes electron microprobe, X-ray diffractometer, Fourier Transform Infrared Spectrometer, IBM 3081 and 3033 Mainframe computers and Department VAX 11/750, along with a wide variety of microscopes and accessories. Ongoing research related to the above positions includes studies of greenschist facies volcanics, arcane sediments, ocean floor and ocean basins, fusion-track dating, R-Ar and Ar-Ar, oxygen isotope mass spectrometry, carbonate geochemistry, and clay mineralogy.

Applicants should submit a vita, representative reprints, and a statement of teaching and research interests and arrange for three letters of recommendation to be sent to: Chairman, MCV Search Committee, Department of Geology, Louisiana State University, Baton Rouge, LA 70803.

LSU is an equal opportunity/affirmative action employer.

South Dakota School of Mines and Technology.

The Department of Geology and Geological Engineering is seeking applicants for a full-time tenure track position in structural engineering. The position is at the Assistant Professor level. The position is located in Rapid City, SD 57701. Applicants should have a Ph.D. degree in geotechnical or petroleum engineering or geology, and a minimum of five years of professional experience in structural engineering. The position is located in Rapid City, SD 57701.

The Department has an undergraduate enrollment of 200 majors and a graduate enrollment of 60. Field applications are emphasized. Interested persons should send a resume and three letters of recommendation to: Dr. J. L. Blevins, Department of Geology, South Dakota School of Mines and Technology, Rapid City, SD 57701.

Deadline for applications is February 1, 1985. SDSMT is an equal opportunity employer.

Graduate Fellowships/University of Oklahoma.

The School of Geology and Geophysics offers fellowships for Ph.D. study in each of the following fields: (1) structural geology, (2) sedimentary geology, (3) tectonics and tectonic evolution of continental lithosphere, including geophysical properties and structures of the upper crust, (4) sedimentary basins, including organic and inorganic diagenesis, evolution of hydrocarbons, and correlation using biostratigraphic methods. Average fellowship stipends are for \$10,000 per year. Applications should be sent to: Dr. William F. Nadeau, Chairman, Department of Geology and Geophysics, University of Oklahoma, 800 Van Vleet Oval, Norman, OK 73019.

The School of Geology and Geophysics presently consists of 19 full-time faculty. Research facilities in the school include a stable isotope laboratory, geochronology laboratory, computer automated X-ray diffraction and fluorescence equipment, atomic absorption and neutron activation analysis equipment, scanning electron microscope with energy dispersive analyzer, transmission electron microscope, fish-trap, dating laboratory, fluid inclusion microthermometry laboratory, 2-MHz hydrothermal laboratory for phase equilibrium studies, high-pressure rock mechanics laboratory, paleomagnetic laboratory with a cryogenic magnetometer and thermal and AF demagnetization apparatus, 24-, 48-, and 192-channel digital seismic recording system, a VAX 11-750 computer with high-resolution graphics and image-display terminals, with seismic and image processing software, and a 84,100 volume geology and geophysics library located in the department.

For further information on faculty and active research projects, contact: Kevin Crowley, School of Geology and Geophysics, University of Oklahoma, 800 Van Vleet Oval, Norman, OK 73019.

Structural Geology/Duke University. The Department of Geology invites applications for a senior-level tenure track position in structural geology. We are seeking an individual with a proven research record and international recognition in his/her field. The Department has active research programs in geophysics, sedimentology, geochronology, igneous petrology, carbonate petrology, marine geology and paleontology; graduate programs for both the M.S. and Ph.D. degrees are offered. Applicants should send a curriculum vitae and names and addresses of six references. The position is to be filled by September, 1985. Closing date for applications and nominations is December 31, 1984. Applications, nominations and inquiries should be directed to: Chairman, Search Committee, Department of Geology, Duke University, PO Box 92700, Durham, NC 27709.

Duke University is an equal opportunity/affirmative action employer.

Sedimentary Geochemistry/Geologist. The Department of Geological Sciences at Lehigh University announces the availability of a tenure track position at the Assistant Professor level starting September 1, 1985. The successful candidate will be expected to teach both graduate and undergraduate courses and to maintain an active research program. Primary consideration will be given to those who have research experience and professional interests in low-temperature sedimentary geochemistry, limit unutilized candidates in related research areas will also be considered. The Department of Geological Sciences has nine faculty members and several graduate students. Research facilities include automated XRF and XRD within the department; electron microprobe; analytical SEM; TEM, AA, etc. are available on campus. Research interests include sedimentary geochemistry, full curriculum vitae, and names of three references by December 15, 1984 to: Charles B. Selar, Chairman, Department of Geological Sciences, Lehigh University, 281 Williams Building, Bethlehem, Pennsylvania 18018. Applications received after December 15 may not be given full consideration.

Lehigh University is an equal opportunity/affirmative action employer. Women and minorities are especially encouraged to apply.

Coastal Physical Oceanographer. The College of Marine Studies invites applications for a tenure track position in physical oceanography. Applicants should have a background in coastal or estuarine physical oceanography, with experience in observational work at sea. The successful applicant will have the opportunity to develop an independent research program which may include studies of physical oceanographic research within existing interdisciplinary research programs in Delaware Bay or the adjacent continental shelf. Facilities available include the 190-foot coastal research vessel, Cape Henlopen. Teaching at the graduate level will be required, and the successful candidate will be expected to develop a funded research program involving graduate students. It is anticipated that the successful candidate will be at the Assistant Professor level, but applications from more senior persons are welcome. Applicants should send curriculum vitae, pertinent reprints, and the names of three references to the chairman of the search committee, Dr. Richard Garvine, Oceanography Program, College of Marine Studies, UNIVERSITY OF DELAWARE, Newark, DE 19713. (302) 451-0109. The closing date for applications is November 30, 1984.

Senior Hydrologist. The Monterey Peninsula Water Management District invites applications for a position of SENIOR HYDROLOGIST. The MPWMD is a small, progressive planning and regulatory agency that deals with problems ranging from designing a new water supply project to groundwater management and riverbank and watershed erosion. The preferred candidate will have a MS or Ph.D. and three years of work experience in a generalist position with both surface and groundwater; be able to do independent research, applying modern techniques to applied problems; be able to communicate effectively with the Board of Directors and the general public. Salary comparable to USGS. The MPWMD is an equal opportunity employer, and hopes to fill the position by January 1985. Send resume to Bruce Buel, General Manager, MPWMD, P.O. Box 83, Monterey, CA 93940.

Sedimentology/University of Utah. The Department of Geology and Geophysics at the University of Utah seeks applicants for a tenure track faculty position in sedimentology at the assistant to associate professor level. Applicants with backgrounds and specialties in sedimentology, seismic reflection, and geophysical interpretation of seismic data are preferred. The position is located in Salt Lake City, Utah. The University of Utah is an equal opportunity/affirmative action employer.

Mathematical/Numerical Analysis/USDA. Agricultural Research Service. The USDA-ARS, Hydro-Ecosystem Research Unit, Fort Collins, Colorado, has an immediate opening for a Numerical Analyst (GS-12-15). The Hydro-Ecosystem Research Unit is an interdisciplinary group with scientific and technological research activities in applied soil physics, surface hydrology, groundwater hydraulics, alluvial aquifers, and water and wind erosion. The major objectives of this unit include the development and evaluation of large-scale computational models of agricultural ecosystem processes. The site offers excellent working and computer facilities, with ready access to state-of-the-art technical libraries and laboratories, and high-powered scientific computer systems in nearby Colorado State University campus.

The incumbent will provide theoretical, computational and software design support for the development of large-scale computational models. Preferred candidates should have an advanced degree in mathematics, physics, engineering, or an equivalent combination of education/professional experience. The following selective factors will distinguish qualified candidates from those not qualified: (1) knowledge of FORTRAN language programming and its application of advanced numerical techniques, including finite difference and finite element methods, to the solution of multi-dimensional problems; (2) knowledge of fluid dynamics and turbulent transport concepts; (3) knowledge of the application of vector processing techniques to large-scale problems; (4) knowledge of the preparation of technical reports and model documentation is desirable.

This is a permanent Federal Civil Service position. Applicants must be U.S. citizens. Interested persons should send a completed Standard Form 171, College Transcript or a List of College Courses using OPM Form 1170/17, and supporting documents such as names, addresses, and telephone numbers of at least three professional references to the person and address listed below. The above is a summary of the qualifications; applicants may call for further information, application procedures, and necessary forms, or write to:

Dr. Shimo P. Neuman
Department of Hydrology and Water Resources
University of Arizona
Tucson, Arizona 85721

The University of Arizona is an affirmative action/equal opportunity employer.

Graduate Research in Marine Geochronology. The Hawaii Institute of Geophysics invites applications from students for a graduate research position leading to the M.A. or Ph.D. degree in Oceanography or Geology/Geophysics. Specific areas of research include: sediment burial diagenesis, sediment-seawater-organism interactions, carbonate sedimentology and geochemistry, isotope and trace element geochemistry, organic geochemistry, nutrient geochemistry, submarine hydrothermal/geothermal processes including seawater-basalt interactions and mineral genesis, and biogeochemical cycling. Current teaching/research stipends are \$6,000-\$10,000 for an 11-month appointment in addition to tuition remission. For further information contact:

Dr. Fred T. Mackenzie, Head
Marine Geochronology Division
Department of Oceanography
Hawaii Institute of Geophysics
1000 Pope Road, Hilo 96720
Hawaii, HI 96720

Hydrologist. Monterey, California. \$1,877 to \$2,583 per month plus benefits. Requires BS in Hydrology, master's program in progress, and three years' experience. Apply by 5:00 p.m. November 15, 1984. Send resume to Monterey Peninsula Water Management District, P.O. Box 85, Monterey, California 93940. Call 408-643-1868 for job flyer.

EOE.

Texas Tech University/Geophysicist or Coastal Sedimentologist. The Department of Geosciences at Texas Tech University seeks applications for a tenure track position in the field of geophysics or coastal sedimentology to begin August 1985. Rank and salary will be commensurate with qualifications. The Ph.D. is required. Entry-level applicants will be given preference. The primary responsibility would be to teach both graduate and undergraduate courses in geophysics or coastal sedimentology and sedimentology, hydrogeology, and hydrogeology. The person will be expected to initiate a research program and to direct M.S. and Ph.D. graduate students. Send a letter of application with complete curriculum vitae and names of three references to: Dr. Alberto D. Jucha, Chairman of Geosciences, P.O. Box 4106, TTTU, Lubbock, TX 79409.

Texas Tech is an equal opportunity/affirmative action employer. Application deadline: January 31, 1985.

Professor (Research)/Stanford University/Plasma Physics, EM Waves, Space Physics. We are seeking a senior person who has demonstrated scientific, managerial, and leadership qualifications in one or more of the following disciplines: Space Plasma Physics, electromagnetic waves, and solar-terrestrial physics. We expect the successful candidate to have established an outstanding reputation documented by personal professional writings or other evidence of recognized research leaders in the disciplines mentioned above, and/or awards and other recognition from appropriate professional societies.

It is expected that this individual will develop a research program in one of the disciplines given above working in coordination with ongoing programs within the STAR Laboratory and, possibly, with other activities within the Space Sciences and Astronautics. It is expected that this individual will have a strong background in experimental techniques, either in the laboratory or in the field, including the environment of space; experimental activities in either laboratory or space plasma physics would be regarded as good qualifications. However, close association with theoretical developments in plasma physics and/or electromagnetic theory will clearly be desired. It is expected that the person chosen will have a demonstrated capability for securing federal or other research grant support, or be deemed by the selection committee of being capable of securing such funds.

It is anticipated that the person chosen will devote the major part of his or her time to research activities. However, there is an opportunity for participation in academic responsibilities of the Electrical Engineering Department, including, when time permits, serving on various committees of the department, School of Engineering, and the university. It is expected that the person chosen will participate actively in the training of graduate students.

The Chairman of the selection committee for this position is Professor Robert A. Hellwiel, Professor of Electrical Engineering, Space, Telecommunications, and Astronautics Laboratory, Stanford University, Stanford, California 94305. Other members of the selection committee include Professor P.M. Banks, Professor R.N. Bracewell, Professor L.R.O. Storey, and Professor L. Tyler.

Application deadline is November 15, 1984.

Mathematical/Numerical Analysis/USDA. Agricultural Research Service. The USDA-ARS, Hydro-Ecosystem Research Unit, Fort Collins, Colorado, has an immediate opening for a Numerical Analyst (GS-12-15). The Hydro-Ecosystem Research Unit is an interdisciplinary group with scientific and technological research activities in applied soil physics, surface hydrology, groundwater hydraulics, alluvial aquifers, and water and wind erosion. The major objectives of this unit include the development and evaluation of large-scale computational models of agricultural ecosystem processes. The site offers excellent working and computer facilities, with ready access to state-of-the-art technical libraries and laboratories, and high-powered scientific computer systems in nearby Colorado State University campus.

The incumbent will provide theoretical, computational and software design support for the development of large-scale computational models. Preferred candidates should have an advanced degree in mathematics, physics, engineering, or an equivalent combination of education/professional experience. The following selective factors will distinguish qualified candidates from those not qualified: (1) knowledge of FORTRAN language programming and its application of advanced numerical techniques, including finite difference and finite element methods, to the solution of multi-dimensional problems; (2) knowledge of fluid dynamics and turbulent transport concepts; (3) knowledge of the application of vector processing techniques to large-scale problems; (4) knowledge of the preparation of technical reports and model documentation is desirable.

This is a permanent Federal Civil Service position. Applicants must be U.S. citizens. Interested persons should send a completed Standard Form 171, College Transcript or a List of College Courses using OPM Form 1170/17, and supporting documents such as names, addresses, and telephone numbers of at least three professional references to the person and address listed below. The above is a summary of the qualifications; applicants may call for further information, application procedures, and necessary forms, or write to:

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Dr. Fred T. Mackenzie, Head
Marine Geochronology Division
Department of Oceanography
Hawaii Institute of Geophysics
1000 Pope Road, Hilo 96720
Hawaii, HI 96720

Hydrologist. Monterey, California. \$1,877 to \$2,583 per month plus benefits. Requires BS in Hydrology, master's program in progress, and three years' experience. Apply by 5:00 p.m. November 15, 1984. Send resume to Monterey Peninsula Water Management District, P.O. Box 85, Monterey, California 93940. Call 408-643-1868 for job flyer.

EOE.

Texas Tech University/Geophysicist or Coastal Sedimentologist. The Department of Geosciences at Texas Tech University seeks applications for a tenure track position in the field of geophysics or coastal sedimentology to begin August 1985. Rank and salary will be commensurate with qualifications. The Ph.D. is required. Entry-level applicants will be given preference. The primary responsibility would be to teach both graduate and undergraduate courses in geophysics or coastal sedimentology and sedimentology, hydrogeology, and hydrogeology. The person will be expected to initiate a research program and to direct M.S. and Ph.D. graduate students. Send a letter of application with complete curriculum vitae and names of three references to: Dr. Alberto D. Jucha, Chairman of Geosciences, P.O. Box 4106, TTTU, Lubbock, TX 79409.

Texas Tech is an equal opportunity/affirmative action employer. Application deadline: January 31, 1985.

A WORKSHOP ON ODP DRILLING IN THE N.E. PACIFIC

INPAC (International N.E. Pacific Activities Consortium) announces a workshop to further define a drilling program in the N.E. Pacific using the new ODP drilling ship SEDCO/RP 471, which is scheduled to be in the region in summer 1990. The workshop will take place at the School of Oceanography, University of Washington on February 20-22, 1985. The three-fold purpose of the proposed integrated, multi-disciplinary drilling program will include:

- 1) ridge crest processes on the Juan de Fuca Ridge, 2) convergent margin processes of the Washington, Oregon, and British Columbia coasts, and 3) paleo-oceanography of the N.E. Pacific.

The purpose of the workshop will be to further define major scientific problems that can be addressed by drilling, to identify possible drill sites, to present the results of relevant on-going scientific programs in the area, and to organize the data gathering and synthesis necessary to write a comprehensive drilling proposal to JOIDES. The two and one half day workshop is open to all parties who have an interest in the drilling program in the N.E. Pacific. Interested parties should write to the INPAC Consortium, c/o Paul Johnson, School of Oceanography WB-10, University of Washington, Seattle, WA 98195, prior to 1 December 1984.

American Museum of Natural History. The Department of Mineral Sciences is filling a tenure track position for Assistant Curator beginning July 1985. This is a mainly a research position, but some time is needed for collections management and departmental activities. High quality sample oriented research and publication is the prime responsibility. The field of specialization is mineralogy, broadly defined, and may include and combine aspects of petrologic mineralogy, mineralogy, mineral geochemistry, crystal and thermochronology, mineral physics, X-ray crystallography, ultramicroanalysis, crystal growth, spectroscopy or geology. Major research facilities include a fully automated ARS-SEM electron microprobe, X-ray laboratory, microcomputer, and vast mineral and other collections. The opportunity exists for research and/or teaching collaboration with nearby institutions such as Columbia (Lamont-Doherty Geological Observatory).

Requirements are a Ph.D. in land by the time of appointment and an ability to carry out a research program. It is expected that some research support will be sought outside the Museum. Applications should include: (1) a curriculum vitae, (2) names of three persons familiar with your work, and (3) a statement of research interests and specific projects to be carried out within the next five years.

These must be submitted by November 15, 1984 to:

Martin Philz
Chairman, Search Committee
Department of Mineral Sciences
American Museum of Natural History
New York, NY 10024

An equal opportunity (M/F/H) affirmative action employer.

POSITIONS WANTED

Geologist/Geochemist. 35, M.A., Ph.D. 1983. Specializing in low temperature geochemistry and geochronology with extensive experience in Rb-Sr mass spectrometry. Several publications. Seeks industry, academic research, or government position. Box 027, American Geophysical Union, 2000 Florida Avenue N.W., Washington, DC 20008.

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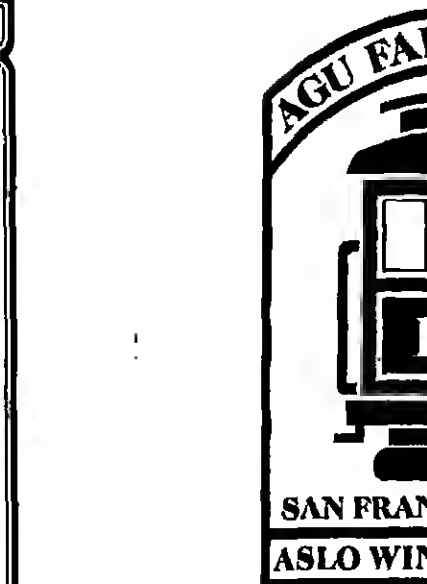
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AGU Fall Meeting ASLO Winter Meeting

Session Highlights

ASLO

Sediment-Water Exchange. These sessions will include talks concerning the importance of benthic fluxes and material balances, the effects of bioturbation and macrofauna on irrigation on exchange rates, mechanisms of transport through boundary layers, instrumentation for measuring benthic fluxes, and seasonal variability in benthic fluxes.

Larval Ecology and Physiology. December 3, 1984. This session will focus on feeding, growth, energetics, dispersal, and recruitment of invertebrate and vertebrate pelagic larvae. New methodologies will be demonstrated for studying the ecology of early life histories.

Arctic/Subarctic Limnology. December 3, 1984. An arctic lake and river have been modified experimentally by changing the nutrient input rates and, for the lake, by changing the predation rate of fish. This allowed tests of questions about the control of ecosystem structure and function through the predators at the top of the food web and through the primary producers at the bottom of the food web. The session papers describe results of studies of chemical and biological processes, ranging from diatom species and phytoplankton to nutrient regeneration from the sediments.

Dynamics of Bio-Optical Interactions. December 4, 1984. Upper ocean optical variability is influenced by biological and physical forcing. These interactions are the subject of observational and modeling studies.

Seismology

The sessions on Nature and

